

**PROTECTIVE HAND COVERING AND DISPENSER APPARATUS**

Reference to Related Application

This application is a continuation-in-part of co-pending U.S. patent application Serial No. 08/725,831, filed October 7, 1996.

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Background and Summary of the Invention

This invention is related to protective hand coverings and particularly to a protective hand covering formed from a sheet of thin flexible film backed by a pressure-sensitive adhesive. The adhesive allows the hand 10 covering to be temporarily bonded to the user's hand during use.

In many fields, such as the dental, medical, food service, laboratory, and precision manufacturing fields, reducing the potential for contamination is a primary concern. 15 Because workers in these fields routinely manually handle contaminated or contaminatable materials, it is critical that some type of barrier be interposed between the hands of the workers and the contaminated or contaminatable materials. Typically, this barrier comprises a latex or plastic film 20 glove or mitten. The user places their hand into the glove or mitten prior to handling the contaminated or contaminatable materials and this prevents contamination from being transferred to or from the substance or object being handled.

There are primarily three routes for the transfer of

contaminates. The first route is the transfer of contaminates from the contaminated material to the user handling the contaminated material. In the dental, medical and other health care fields, the AIDS epidemic has heightened awareness 5 of the possibility of patients infecting their health care workers with the HIV virus through exposure to body fluids. Even before AIDS was a concern, however, the presence of other highly contagious infectious agents, such as hepatitis, justifiably caused serious concerns among health care workers 10 and resulted in procedures and precautions being implemented for reducing this possible route of contamination. For industrial and laboratory workers handling toxic or hazardous materials, particularly persistent toxins such as mercury, lead and pesticides, extreme precautions are taken to avoid 15 any worker exposure to these materials.

A second route is the transfer of contaminates from the user to the contaminatable object or materials being handled. Some types of computer and electrical components, such as disk drive storage media and halogen light bulbs, can 20 be ruined by being merely touched with an unprotected hand. Detectable amounts of oil, moisture, skin flakes, etc. will inevitably be transferred to any object which is handled with an unprotected hand. Laboratory samples and crime scene evidence are two other types of materials that can easily be 25 contaminated if proper protective hand coverings are not worn.

A third route for contamination is the transfer of contaminates from an earlier object handled by a worker to a

later object handled by that worker or a co-worker. This third route is often the most difficult to control because the contamination may be indirect (i.e., it may not be directly from the earlier object to the worker to the later object).

5           Health care workers typically remove their old gloves and put on new gloves prior to examining or treating a new patient. What may be overlooked, however, is that when their gloves become contaminated during examination or treatment of a patient, any object touched by these gloves,  
10 such as a door handle, a pen, a drawer handle, or treatment equipment, may itself become contaminated. When handling particularly virulent infectious agents, an attempt may be made to use cleaning or sterilizing agents, such as chemical solutions, to remove or neutralize contaminates which have  
15 been transferred to these areas. Remedial measures, such as applying cleaning or sterilizing agents, are typically less than completely effective in eliminating contamination. Similar issues arise when industrial or laboratory workers handle toxic, hazardous or contaminated materials. The  
20 preferred method for eliminating this route for contamination is to eliminate the contamination of these areas altogether.

          A primary reason these areas become contaminated is the difficulty of removing and putting on typical hand coverings. Typical hand coverings require that the hand or a  
25 portion of the hand be place inside and positioned with respect to a closed section of the hand covering. It can take a greater part of a minute to remove a contaminated pair of

conventional latex gloves, replace them with a new pair and properly position the new gloves over the user's hands. If after handling potentially contaminated materials, a health care worker must operate treatment equipment, the worker must 5 first remove their current pair of gloves and then put on a new pair of gloves before handling the equipment. To avoid accidentally contaminating the patient with contaminates that may have been present on the machine, the worker must then remove this second pair of gloves and put on a third pair of 10 gloves-before again coming into contact with the patient.

In view of the above and other limitations of the prior art, a primary object of the present invention is to provide a type of protective hand covering which may be easily and quickly put on and removed by the user. Instead of 15 requiring the user to place their hand into a closed section of the hand covering and then position their hand with respect to the hand covering to obtain a proper fit, the inventive protective hand covering is put on simply by bringing an open hand into contact with the pressure-sensitive adhesive on the 20 back surface of the thin flexible film. If the hand is properly positioned with respect to the inventive protective hand covering as it is brought into contact with the pressure-sensitive adhesive, no repositioning of their hand with respect to the hand covering is required to obtain a proper 25 fit. By substantially decreasing the time it takes to remove and put on hand coverings, the time required to perform certain types of procedures can be dramatically reduced.

Increasing the ease of putting on and removing hand coverings will also encourage workers to put on new hand coverings more frequently, which will in turn reduce the likelihood of indirect contamination. Because the inventive protective hand 5 covering may be put on in only a second or two, new hand coverings can be put on for each patient even when every second is crucial.

A further object is to provide a protective hand covering which may be placed directly over other hand 10 coverings, including conventional latex gloves or the present inventive protective hand coverings, already on the hand of the user. This will allow a user already wearing a contaminated hand covering to put on the inventive hand covering and handle an object without contaminating it and 15 without taking the time required to remove the existing contaminated hand covering. As such, the present invention is beneficial where a health care worker must operate treatment equipment after their existing hand covering has been contaminated. To avoid contaminating the equipment, the 20 worker can place the inventive hand covering over their existing hand covering and operate the treatment equipment without concern.

The inventive hand covering may also reduce the total number of hand coverings needed for certain procedures. 25 If the worker described above again needs to come into contact with the patient, the now contaminated inventive hand covering may simply be removed. Because the inventive hand covering

prevented the existing hand covering from being contaminated by contact with the equipment, the existing hand covering would generally not be removed and replaced before the worker again comes into contact with the patient.

5        The inventive hand covering is also fabricated from substantially less material than a conventional hand covering and this results in less waste being generated when the hand covering is disposed of. This reduction waste quantity will result in cost savings compared to the cost of disposing  
10      conventional hand coverings.

      The inventive hand coverings are also anticipated to be more cost effective to manufacture than conventional gloves or mittens.

15      Further objects, features and advantages of the invention will become apparent from a consideration of the following description and the appended claims when taken in connection with the accompanying drawings.

Brief Description of the Drawings

20      Figure 1 is a top down view of the back surface of a protective hand covering in accordance with this invention with a corner turned up to show a portion of the front surface;

25      Figure 2 is a perspective view of the protective hand covering from Figure 1 after it has been adhered to the hand of a user;

      Figure 3 is a tablet formed by a plurality of

protective hand coverings located on top of one another;

Figures 4A and 4B are alternative shapes and patterns of adhesive application for the inventive protective hand covering;

5 Figure 5A illustrates, from an oblique perspective, a preferred dispenser of adhesive film material according to the invention;

Figure 5B illustrates an alternative embodiment of a dispenser incorporating a non-flat base platform;

10 Figure 5C illustrates yet a further alternative embodiment of a dispenser wherein a portion of the outer surface of a film roll housing is used as a base platform;

Figure 6A illustrates the first step of a way in which a user would apply film using the dispenser of Figure 5;

15 Figure 6B illustrates an intermediate step of use of the dispenser of Figure 5A, wherein a hand with film adhered thereto is lifted up to disengage with a cutting edge; and

Figure 6C illustrates a final stage prior to film stretching and hand covering, wherein, by moving the user's hand downwardly, an individualized sheet is torn off from a cutting edge.

#### Detailed Description of the Invention

A rectangular, whole-hand version of the protective hand covering in accordance with this invention is shown in 25 Figure 1 and is generally designated by reference number 10. The protective hand covering 10 comprises a sheet 12 of thin

flexible film 14 which has a front surface 16 and a back surface 18. A pressure-sensitive adhesive 20 is distributed on the back surface 18 of the thin flexible film 14. A corner 22 of protective hand covering 10 is turned up in Figure 1 to 5 allow the side surface 24 and front surface 16 of the hand covering to be viewed.

The sheet 12 of thin flexible film 14 is preferably slightly oversized with respect to the portion of the user's hand intended to be covered by the protective hand covering.

10 The oversized edge portions 26 of the sheet 12 are designed to wrap around and adhere to the sides and a portion of the back of the user's hand for reasons further discussed below. In Figure 1, pressure-sensitive adhesive 20 has been uniformly applied to the entire back surface 18 of thin flexible film 15 14.

In Figure 2, the protective hand covering 10 from Figure 1 is shown as it is used, adhered to the palm of a user's hand 28, resulting in film webs 31. As can be seen in Figure 2, the oversized edge portions 26 of inventive 20 protective hand covering 10 are adhered to the sides and a portion of the back surface of the user's hand 28. The process of adhering the oversized edge portions 26 to the sides and a portion of the back surface of the user's hand 28 is as simple as pressing the palms of the hands together after 25 a protective hand covering has been adhered to each hand and then interleaving fingers 29, to stretch the film webs 31. Oversized edge portions 26 prevent contaminates being

transferred to or from the portion of the user's hand 28 covered by this portion of the protective hand covering 10. Oversized edge portions 26 also help to prevent protective hand covering 10 from being inadvertently dislodged during use 5 and also helps to prevent substances or objects from sliding between the protective hand covering and the user's hand from the edges of the protective hand covering as it is being used.

Thin flexible film 14 must substantially inhibit the transfer of contaminates from the protected area of the user's hand to the potentially contaminated or contaminatable substance or object as well as the transfer of contaminates from the potentially contaminated or contaminatable substance or object to the protected area of the user's hand. In many cases, a material that is impervious to liquids, such as a 15 plastic, polymer, rubber or latex film or a coated paper sheet, will sufficiently inhibit the transfer of the contaminates at issue. In other cases, the contaminates, such as organic solvents, or the operating environment, such as extremely high or low temperatures, require a film that has 20 enhanced barrier or performance characteristics. In certain applications, a film which allows some substances to pass through the film, such as water vapor, while acting as a barrier to other substances, such as bacteria, is preferred. This film can also be a laminate of dissimilar materials to 25 obtain the proper barrier and performance characteristics.

Thin flexible film 14 must be strong enough to avoid being cut, torn or punctured during use. If an opening is

formed in the film as the protective hand covering is used, contaminates can transfer freely from the substance or object being handled to the user's hand and vice versa. The strength requirements of the film will primarily depend on the types of 5 materials being handled, the type of handling these materials typically required, and the expected duration of use of the protective hand covering.

Thin flexible film 14 should be sufficiently soft and pliable to allow the user to maintain significant 10 dexterity after the protective hand covering 10 has been adhered to their hand and to allow the user to freely and independently manipulate their fingers through the hand covering. Thin flexible film 14 will preferably be transparent to allow the protected area of the user's hand to 15 be visible after the protective hand covering has been adhered. It is also desirable to manufacture thin flexible film 14 from a biodegradable material.

Antibacterial agents or other contaminate neutralizing or absorbing materials can be incorporated into 20 the thin flexible film 14 or applied to the front or back surface of the thin flexible film. The front surface 16 of the thin flexible film 14 could also be texturized to reduce the likelihood that an object being handled by a user of the protective hand covering will slip from the users hand.

25 A 1.0 mil thick polyurethane film used as a carrier for a product marketed by Avery Dennison, Specialty Tape Division, 250 Chester Street, Painesville, Ohio 44077 as MED

5020 has generally acceptable performance properties as a thin flexible film 14 for many dental and medical purposes for the inventive protective hand covering 10. This film has a typical tensile strength between 5,000 and 8,000 psi and an 5 elongation between 400 and 700%. This film acts as a bacterial barrier, yet has a high moisture vapor transmission rate which would allow moisture from the user's hand to be released as the protective hand covering is being used, rather than trapped by the film. This film is very soft and pliable, 10 which allows the user to maintain significant dexterity after the hand covering has been put on and allows the user to freely and independently manipulate their fingers. This film is transparent, which allows the protected portion of the user's hand to be visible after protective hand covering 10 15 has been put on. For many applications, linear low density polyethylene or polyurethane films are generally suitable materials for thin flexible film 14.

The pressure-sensitive adhesive 20 must be capable of providing a sufficiently strong bond when adhered to the 20 user's hand to inhibit the inventive protective hand covering from being dislodged during use. The adhesive must also offer a sufficiently weak bond to allow the hand covering to be removed without damaging the user's hand. Because the protective hand covering 10 may be applied over other hand 25 coverings, such as a conventional latex glove or the present inventive protective hand covering 10, the adhesive characteristics of the pressure-sensitive adhesive with

respect to the external surface of these types of hand coverings must also be considered.

Pressure-sensitive adhesive 20 will preferably be comprised of medical and food contact grade substances which 5 will be nonirritating and nonsensitizing in humans.

Pressure-sensitive adhesive 20 could consist of a waxy material, such as microwax SP18 from Strahl and Pitch, an acrylic adhesive such as ARcare 7396 or ARcare 8072 from Adhesives Research, Inc., Glen Rock, Pennsylvania, a hot melt 10 adhesive, such as HL2306-x, HM1902 or HL2385-x from H.B. Fuller Company, Vadnais Heights, Minnesota, or a conventional pressure-sensitive adhesive, such as Duro-Tac 4227 from National Starch and Chemical, Bridgewater, New Jersey.

Pressure-sensitive adhesive 20 could also be a 15 tacking resin such as ESCOREZ or Vistanex polyisobutylene LM from Exxon. This tacking resin could be placed on the back surface 18 of thin flexible film 14 or could be mixed into the material forming thin flexible film 14.

Pressure-sensitive adhesive 20 will generally be 20 applied to the back surface 18 of thin flexible film 14 around at least the periphery of the sheet 12, where the thin flexible film 14 will contact the portion of the user's hand 28, being protected by the inventive protective hand covering 10.

25 Sufficient pressure-sensitive adhesive 20 should be applied to the back surface 18 of thin flexible film 14 to assure that protective hand covering 10 is not dislodged

during use. Pressure-sensitive adhesive 20 should be applied to the back surface 18 of the thin flexible film 14 wherever it is critical that the film be adjacent to the user's hand.

It is also possible to adhere protective hand covering 10 to the user's hand 28 through the use of electrostatic attraction. A positive or negative electrical charge can be introduced into the protective hand covering 10 and an opposite electrical charge can be introduced into the user's hand 28. These opposing electrical charges will cause the protective hand covering 10 to be attracted to and adhered to the user's hand 28. To obtain a sufficient electrical charge to firmly adhere protective hand covering 10 to the user's hand 28, an electrically conductive material may be incorporated within or attached to thin flexible film 14. To obtain an appropriate opposite electrical charge, the user of protective hand covering 10 may step on a floor mat, touch a charged electrical conductor, or be physically connected to an electrical source before their hand is brought into contact with protective hand covering 10.

As an alternative, the thin flexible film 14 and adhesive 20 could be provided as a single component. For example, the user's hand could be dipped in a liquid silicone or latex bath, thereby coating the user's hand with a suitable thin flexible film 14. The latex or silicone could be provided in a composition that readily cures upon exposure to air or ultraviolet light. When the protective hand covering 10 is no longer required, the thin flexible film 14 can be

removed from the users hand by merely peeling the sheet away.

Several methods for packaging and dispensing the inventive protective hand coverings are feasible. Figure 3 shows a stack of protective hand coverings 10 which are 5 packaged in tablet format. Tablet 30 is formed by joining a plurality of protective hand coverings 10, either a common edge or the back surface of each protective hand covering being joined to front surface of the protective hand covering directly above it. The affinity of the adhesive for the 10 opposing surface of the adjacent sheet would need to be, in this instance, less than the affinity of the adhesive for the user's hand. This could be accomplished by treating front surface 16 with a release coating such as silicone or petroleum gel. In this way, individual sheets can be removed 15 from the tablet allowing the user to merely place one hand on the tablet and then lift his hand from the tablet to remove a sheet, repeating the same for the other hand. In other packaging and dispensing methods, each hand covering or pair of hand coverings are attached to a liner sheet. These hand 20 covering/liner sheets can also be packaged in tablet format. Instead of a tablet format, the sheets could also be joined in fan-fold format (i.e., the first and second sheets are bound at the back, the second and third sheets are bound at the front, the third and fourth sheets are bound at the back, 25 etc.). The hand coverings could also be dispensed from a continuous roll or attached to a continuous roll of liner sheet which could be mounted in a holder. A grab knob linked

to a ratchet mechanism could be used to advance the liner sheet the appropriate amount which would make the protective hand coverings available to the user.

Figures 4A and 4B represent two of a wide variety of 5 alternative shapes which are possible for the inventive protective hand covering 10. Figures 4A and 4B also show two alternative patterns for applying pressure-sensitive adhesive 20 to the back surface 18 of the sheet of thin flexible film 14. Figure 4A shows a five-finger whole-hand design 32 for 10 the hand covering with the pressure-sensitive adhesive 20 being applied as a series of parallel stripes across the back surface of the film. A tab 34 portion, which does not have pressure-sensitive adhesive 20 applied to it, is shown in Figure 4A at the bottom of the wrist portion 36 of the hand 15 covering.

The removal tab 34 will facilitate the removal of the protective hand covering 10 after it has been adhered to the user's hand by providing a tab or flap of the thin flexible film material that is not adhered to the hand of the 20 user that can be grasped by the user as they begin to peel off the protective hand covering. Figure 4B shows a mitten design 38 for the hand covering with the pressure-sensitive adhesive 20 being applied as a plurality of discontinuous dots on the back surface of the film. An upper forearm portion 40 has 25 been added at the bottom of the wrist portion 36 of the mitten design 38 to prevent contamination to or from the upper forearm of the user. Protective hand covering 10 could also

be formed in a kidney bean shaped design which covers the fingers and thumb of a user's hand and the upper portion of the palm. Because objects being handled are frequently touched only by these portions of the user's hand, covering only these 5 areas of the user's hand will be sufficient for many purposes. Other possible designs include a paddle design or a three-finger partial-hand design.

As seen by the examples in Figures 1, 4A, and 4B, the adhesive may be distributed on the back surface in a wide 10 variety of uniform patterns, such as a solid film, narrow stripes, broad stripes, dots, grid, etc. or nonuniform patterns, such as only at the periphery of the thin flexible film, in strategic locations, etc.

Figure 5A is a drawing of a preferred dispenser of 15 protective hand coverings according to the invention, as seen from an oblique perspective generally at 50. In this particular configuration, a roll of flexible adhesive film 52 is installed into a housing 54 which may conveniently be 20 cylindrical in shape, as shown. The roll of film 52 is installed such that the tacky side of the film is oriented toward the center of the roll, and brought out into a platform area 54 terminating in an edge 55. <sup>on a member</sup> <sup>58</sup> adapted to snag, cut or otherwise sever the film into individual sheets.

The edge 55 may be configured differently in 25 accordance with the type of film actually used, the availability of perforations, and so forth. Preferably, the film includes a perforated transverse section, and the edge 55

features a set of upwardly oriented projections which at least retain the film, as best seen in Figure 6C, so that it may be torn along the perforated area. Without perforations, the edge 55 or the projections may be sharpened to provide a more 5 pronounced cutting action. A heat knife may alternatively be used.

The housing 52 preferably includes a transverse slot 53 through which the film from the roll is drawn into the platform area. To ensure that the film does not get caught up 10 in the roll, it is dressed around one edge of the slot with the tacky side facing outwardly. Although a smooth edge may be used, to assist with delivering one or more elongated rollers 56 may be provided for such purpose.

Although the film in the platform area may simply be 15 suspended between the edge of the slot and the housing 52 and the tearing edge 55 as shown, in preferred embodiments some form of base 57 is provided immediately beneath the platform area so that a user need not press the film down too far, perhaps stretching or tearing it, in a manner inconsistent 20 with that shown in Figures 6A through 6C. The base 57 may be a rigid panel, or, more preferably, may include some resiliency so that as a user presses his or her hand into the film at the platform area and against the base member 57, at least a slight amount of stretching and covering the sides of 25 the fingers takes place. Accordingly, the base member 57 may be comprised of some type of foam, and, for that matter, may include a centralized hand-shape outline or depression into

which a user places his or her hand through the film in the platform area and into to enhance this partial stretching/side-covering affect.

The platform base need not be flat, but rather, as shown in Figure 5B, may be humped or otherwise curved, in which case a user may grab the resulting form for the purpose of adhering the film to the hand. As shown in Figure 5C, with an aperture 59 disposed along the side of the film-roll housing, the outer surface of the housing itself may be used as a pole-shaped platform base in a very compact configuration. In any case, adhering of the film preferably takes place with the fingers of the hand ~~ot be~~ <sup>covered</sup> outstretched though, with sufficiently thin or stretchable film, fanning of the fingers may occur after adherence.

It is assumed that the housing 52 and the element 59 including the edge 55 are somehow rigidly attached to one another to form an integrated unit, which may, in fact, be accomplished through mounting to a horizontal or vertical surface. The overall size of the dispenser is inconsequential, so long as the material made available in the platform area is sufficiently large to receive at least one of a user's hands, which will be on the order of 10 inches to a foot square, or thereabouts.

Figures 6A through 6C illustrate the way in which a user would apply a section of inventive adhesive film utilizing the dispenser of Figure 5. It is noted that these figures only show film adhesion, and do not illustrate the way

in which the film would be stretched and/or applied to the side and back of the hand, as this has been disclosed earlier. In Figure 6A, a user places a hand 62 onto the film 64 into the platform area, such that the palm of the hand (which 5 includes the palmar surfaces of the fingers) makes contact with the upwardly oriented adhesive layer. Again, some base member may be positioned beneath the platform area to assist in this aspect of the process.

In Figure 6B, having made contact to the sheet of 10 film, the user may detach the adhered sheet from the teeth of the cutter by pulling up with the hand, enabling the material to be freely drawn from the roll within the housing container. In Figure 6C, having drawn the material once again past the edge associated with separating the film into sheet form, the 15 user simply pulls the hand downwardly against the edge as shown, thereby tearing off an individualized sheet for that hand. Note that, through this process, the film is once again temporarily held by the blade of the cutter as shown in Figure 5, ready again for the next use.

20 Although sides to the housing have not been shown in these drawings to illustrate the disposition of the inner roller of material, clearly in a more robust embodiment, having installed the roll of material into the housing, one or more sides may be affixed thereto to prevent the roll from 25 coming out until spent.

I claim: